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"जानने का अधिकार, जीने का अधिकार"
Mazdoor Kisan Shakti Sangathan
"The Right to Information, The Right to Live"

"पुराने को छोड़ नये के तरफ"
Jawaharlal Nehru
"Step Out From the Old to the New"

IS 10105 (1982): Fittings for cylinder pressure indicators for internal combustion engines [TED 2: Automotive Primemovers]

"ज्ञान से एक नये भारत का निर्माण"
Satyanarayan Gangaram Pitroda
"Invent a New India Using Knowledge"

"ज्ञान एक ऐसा खजाना है जो कभी चुराया नहीं जा सकता है"
Bhartṛhari—Nītiśatakam
"Knowledge is such a treasure which cannot be stolen"

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Indian Standard

SPECIFICATION FOR FITTINGS FOR CYLINDER PRESSURE INDICATORS FOR INTERNAL COMBUSTION ENGINES

1. Scope — Covers the fittings for cylinder pressure indicators for slow and medium speed reciprocating internal combustion engines.

1.1 It also covers dimensions of indicator diagram sheets, valve and cock connections to the indicator and to the engine and limits of accuracy of reducing gear.

1.2 The design of cylinder pressure indicators is not covered.

2. Nomenclature — Shall be as given in Fig. 1 and 2 (*see* pages 4 and 5).

3. Types — Indicator valves shall be of the following types:

Form *A*1   : Full steel type without cap, with one-piece spindle;
Form *AV*1 : Full steel type with cap, with one-piece spindle;
Form *A*2   : Full steel type without cap, with two-piece spindle;
Form *AV*2 : Full steel type with cap, with two-piece spindle;
Form *B*1   : Valve of copper zinc alloy, thread in neck of steel without cap, with one-piece spindle;
Form *BV*1 : Valve of copper zinc alloy, thread in neck of steel with cap, with one-piece spindle;
Form *B*2   : Valve of copper zinc alloy, thread in neck of steel without cap, with two-piece spindle; and
Form *BV*2 : Valve of copper zinc alloy, thread in neck of steel with cap, with two-piece spindle.

4. Materials

4.1 *Valve Casing* — Form *A* : Steel, selected subject to agreement between the manufacturer and the purchaser.

Form *B* : Copper zinc alloy having the following composition:

Constituent	Percent
Cu	59·5 — 61·5
Al	0·05
Fe	0·3
Mn	0·1
Ni	0·3
Pb	0·3
Sb	0·01
Sn	0·2
Zn	Remainder

Density : 8·4 kg/dm³
Tensile strength : 340 N/mm², *Min*

Note — Threaded neck shall be made of a suitable grade of steel as agreed to between the purchaser and the manufacturer.

4.2 *Valve Seal* — Alloy, resistant to rust and sealing resistance up to 700°C.

IC Engines Sectional Committee, EDC 14 [Ref : Doc : EDC 14 (3359)]

4.3 *One-Piece Spindle*

Form *A*1
Form *AV*1   Shall have threaded taper point made of rust
Form *B*1   } and sealing resistant alloy as used for valve
Form *BV*1   seal

4.3.1 *Spindle guide* --- The spindle guide for all the forms mentioned in **4.3** shall be made of copper alloy having the following composition:

Constituent	Percent
Cu	58 — 61
Mn	1 5 — 2·5
Ni	2 — 3
Pb	0 — 0 8
Al	0·3 — 1·5
Fe	0 — 0·5
Sn	0 — 0 5
Zn	Remainder

Density: 8·3 kg/dm^3

Tensile strength : 440 N/mm^2, *Min*

4.3.1.1 Recommended material is HTB 1 grade of IS : 304 - 1981 ' High tensile brass ingots and castings (*second revision*)'.

4.4 *Two-Piece Spindle*

Form *A*2
Form *AV*2   Copper alloy with composition as given
Form *B*2   } in **4.3.1** or **4.3.1.1.** Inserted taper point with
Form *BV*2   sealing resistance of alloy up to 700°C

4.4.1 *Spindle guide* —Shall be made of steel, the grade of which shall be decided upon by agreement between the purchaser and the manufacturer.

4.5 *Handle* — Shall be made from suitable plastic to withstand cylinde block temperatures.

4.6 *Cap* — Shall be made from copper zinc alloy (form and material composition as agreed to between the purchaser and the manufacturer).

5. Dimensions and Tolerances

5.1 *Indicator Valves* — Dimensions and tolerances shall be as given in Fig. 1 and Fig. 2 (see pages 4 and 5).

5.2 *Handles* — Dimensions of handles shall be as given in Fig. 3 (see page 6).

5.3 *Indicator Diagram Sheets* -- Shall conform to the following sizes:

Large Size	145 mm × 65 mm
Small Size	115 mm × 45 mm

6. Selection of Indicator Valves and Drilled Passages in the Cylinder Head (*see* Fig. 4 on page 6) --The axis *R* should be so located with respect to the cylinder axis that the effect of the velocity component along the axis of the passage in cylinder head is least. This can be achieved by avoiding bumping clearance zone and edge of piston cavity.

Therefore $R \leqslant 0.75 \times \dfrac{D}{2}$

6.1 To avoid combustion in the additional volume created, the following relationships hold good:

$\alpha \leqslant 0.25$, and

$\dfrac{d_r}{d_k} \leqslant 6$

where

$$\alpha = \frac{V_r}{V_k} = \frac{\text{Volume of the probe chamber}}{\text{Volume of the largest drilled hole}} = \frac{\pi/4 \times d_r^2 \times l_r}{\pi/4 \times d_k^2 \times l_k}$$

For explanation of symbols d_r, l_r, d_k and l_k reference to Fig. 4 shall be made.

ISI

AMENDMENT NO. 1   OCTOBER 1983
TO
IS:10105-1982   SPECIFICATION FOR FITTINGS FOR CYLINDER
PRESSURE INDICATORS FOR INTERNAL
COMBUSTION ENGINES

Corrigendum

(*Page 4, Fig. 1, DETAIL AT Y*) —Substitute '2.54' *for* '25.4'.

(EDC 14)

6.2 To minimize the effect of drilled passage on the compression ratio, following relationship holds good:

$$\frac{100 \times V_a}{V_c} \leqslant 4$$

where

V_a = total extra volume created = $V_r + V_k$; and

V_c = combustion chamber volume

= $\dfrac{\text{Swept volume}}{\text{Compression ratio} - 1}$

6.3 The ratio $\dfrac{60\,\omega}{n}$ shall be as high as possible but not less than 6

where

ω = resonant frequency for the passage arrangement in Hz, and

= $\dfrac{k \times a_0}{l_k\sqrt{1 + \alpha}}$

where

k = a constant whose value is between 2 and 3,

a_0 = acoustic velocity in air under normal atmospheric conditions,

= 343 000 mm/sec,

n = engine speed in rev/min, and

α = value obtained in **6.1**.

6.4 On the basis of the above calculations, drilled passages in the cylinder head shall be selected.

7. Indicator Reducing Gear

7.1 *Spring Loading* — Where an indicator with a reciprocating drum motion is used, the reducing gear shall be spring loaded so as to prevent any lost motion so that the work of the indicator drum spring is limited to returning the drum and its cord only.

7.2 *Limits of Accuracy* — Indicator reducing gear shall be driven from a reciprocating or rotating part of the enging in such a manner that at all positions in its stroke the ratio of the output travel of the reducing gear to the corresponding travel of the engine piston shall be constant within ± 2 percent.

8. Tests — Pressure test shall be performed on the indicator valve first with water and then with air (*see* Appendix A).

9. General Requirements

9.1 *Operation* — The spindle threads shall operate smoothly. The threads shall conform to IS : 4218 - 1976 ' ISO metric screw threads ' and shall be coated with molybdenum disulphide or a similar agent.

9.1.1 Other existing threads may be used if acceptable to user.

9.2 *Backlash* — The backlash within the threads shall be between 0·2 and 0·4 mm.

10. Designation

10.1 Designation of an indicator valve of Form *A*, without cap, with one-piece spindle (1) and metric threads (M) shall be :

Indicator Valve A1   M IS : 10105

10.2 Designation of an indicator valve of Form *B*, with cap (V), with two-piece spindle (2) and metric threads (M) shall be:

Indicator Valve BV2   M IS : 10105

11. Marking — Each indicator valve shall be marked with the following information:

a) Manufacturer's name or trade-mark, if any;
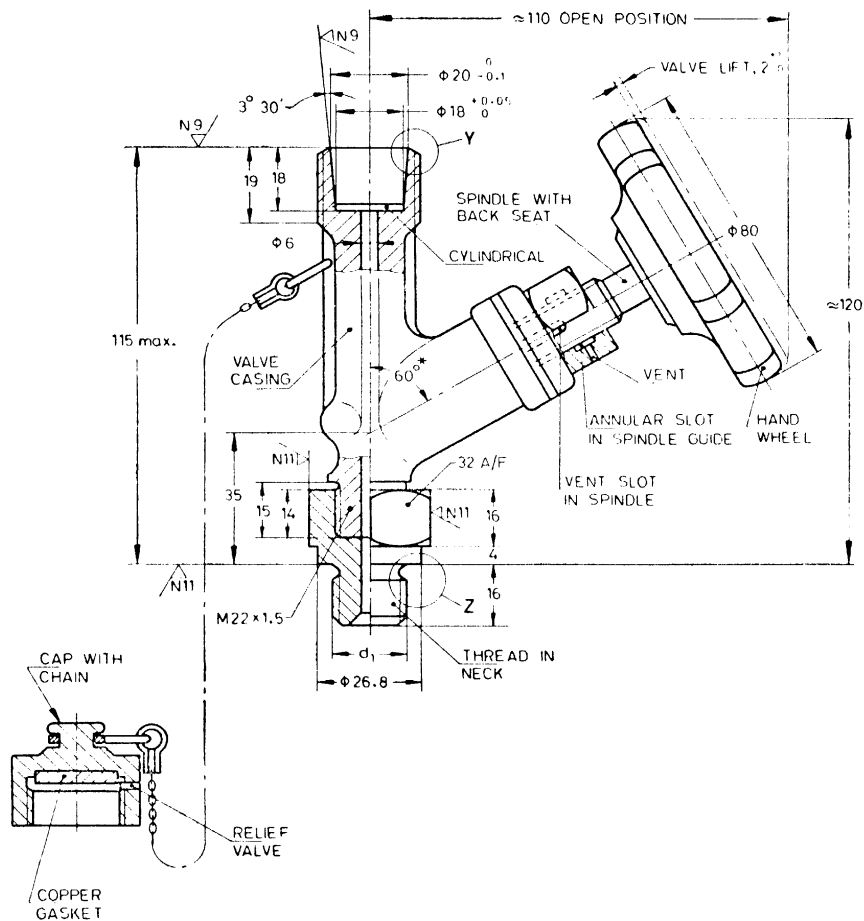
b) Form; and

c) Number of this standard.

11.1 *ISI Certification Marking* — Details available with the Indian Standards Institution.
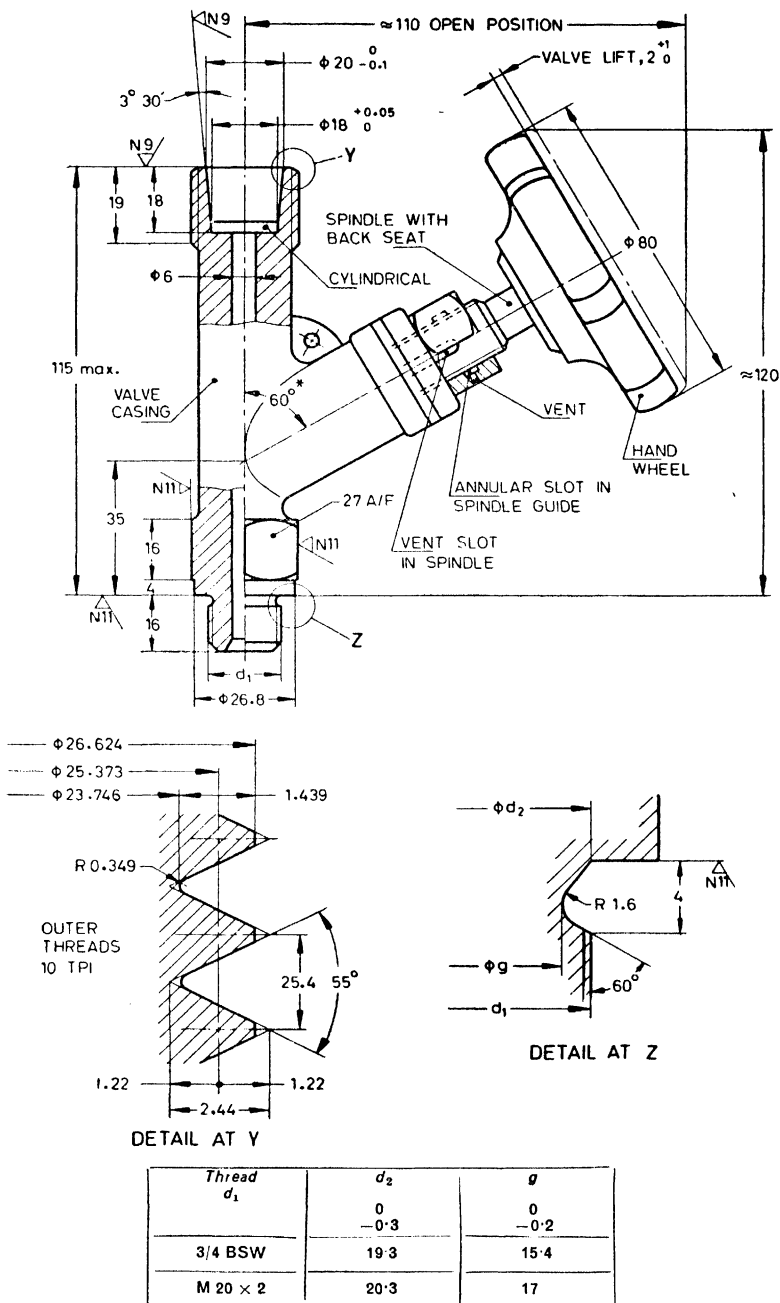
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FIG. 1 DIMENSIONS FOR FORM A INDICATOR VALVES

*Other angles may also be used until the existing jigs and tools of the manufacturers get worn out and have to be replaced.

All dimensions in millimetres.

Thread d_1	d_2	g
	$\begin{matrix}0\\-0.3\end{matrix}$	$\begin{matrix}0\\-0.2\end{matrix}$
3/4 BSW	19·3	15·4
M 20 × 2	20·3	17

Note — For details at *Y* and *Z see* Fig. 1.

*Other angles may also be used until the existing jigs and tools of the manufacturers get worn out and have to be replaced.

All dimensions in millimetres.
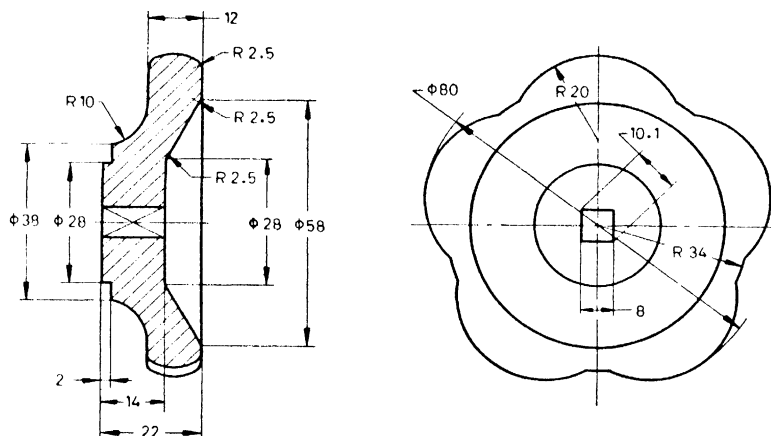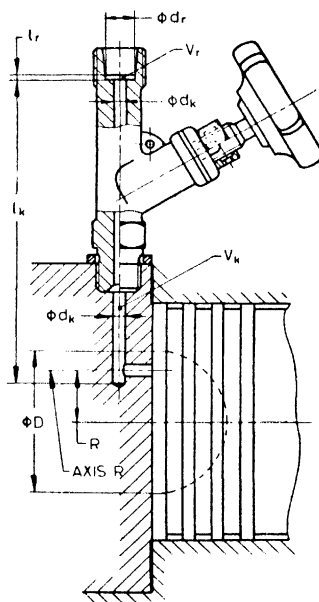
FIG. 2 DIMENSIONS FOR FORM B INDICATOR VALVES (FORM *BV* REPRESENTED)

Thread d₁	d₂	g
	0 −0·3	0 −0·2
3/4 BSW	19·3	15·4
M 20 × 2	20·3	17

All dimensions in millimetres.

FIG. 3 DIMENSIONS FOR HANDLES

ϕD — Thread diameter of piston cavity,

R — Radial distance of hole opening in the main combustion chamber from cylinder axis,

l_k — Length of the longest drilled hole,

ϕd_k — Diameter of the longest drilled hole,

l_r — Length of probe chamber,

ϕd_r — Mean diameter of the probe chamber,

V_k — Volume of the longest drilled hole, and

V_r — Volume of the probe chamber.

FIG. 4 SELECTION OF DRILLED PASSAGES IN INDICATOR VALVES

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A P P E N D I X   A

(*Clause* 8)

PRESSURE TEST

A-1. Method of Test — The indicator valve shall be subjected first to water and then with air at a pressure of 20 MPa. While passing air, soap solution around joints of valve and points of opening shall be applied to check leakage.

A-2. Evaluation — The pressure indicator shall register a pressure of 20 MPa and there shall be no leakage of water or air. In the case of air, leakage will be evident if soap bubbles emanate on application of soap solution while subjecting valve to test with air.

E X P L A N A T O R Y   N O T E

Indicator valves are used as fittings for connecting indicators to cylinder heads of internal combustion engines. Indicators record the pressure curve of the individual cylinders in relation to the piston stroke as pressure-stroke graph. The internal construction of the valve is left to the manufacturer's choice.

In this standard only a few broad guidelines are given. These take into account the possible differences in types and allow the required type to be designated in a standard form in the order. A clause on selection of valves and drilled passages in cylinder head has also been included.

The existing fittings have ⅜ inch BSW threads for the neck threads. An option of metric thread M 20 × 2 has been provided for changeover to ISO metric threads. The disadvantage of the possibility of a greater variety in ordering has been accepted in order to encourage the changeover to metric thread. However, new designs should specify only ISO metric threads.

In the preparation of this standard, assistance has been derived from DIN 6273 - 1973 ' General purpose internal combustion engines indicator valves', issued by the DIN Deutsches Institut für Normung.

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